Indian Institute of Information Technology Sri City, Chittoor

IIITS/BCI-S2022/EndSemExam **Date: 18/04/2022**

Course Name: Brain Computer Interaction (BCI) Duration: 3 hours
Total Marks: 50

S20190010007

Instructions:

1. This is a closed book, closed notes exam.
2. Answers must be given in pen. Answers in pencils will not be checked.
3. Mobile phones and laptops are not allowed. You can use scientific calculators if needed.
4. Clearly mention which question has been answered by writing question no. properly for respective answers.

Q1. Compare and contrast the following types of evoked potentials (EPs): P300, VEP, SSVEP, AEP, and SSEP. [7]

Q2. What is a mother wavelet, and how is it used in the wavelet transform? Explain how the wavelet transform differs from the Fourier transform in terms of the basis functions they use. [7]

Q3. SVMs and perceptron both use linear hyperplanes to separate data into two classes. Why then does the SVM typically outperform the perceptron when it comes to generalization to new data? [10]

Q4. Given the data samples below. Consider the data was feed to a Neural Network with one hidden layer and two neurons. Initial weights for all connections is 0.2 and sigmoid activation function is applied at both hidden and output layer.

	X1	X2	X3	Target
P1	0.3	0.1	0.4	1
P2	0.2	0.9	0.3	2
P3	0.2	0.1	0.3	1
P4	0.2	0.3	0.2	2

Calculate the activation value at each neuron and find out the updated weights for each pattern P_i using back propagation. [10]

Q5. Compare and contrast the following [10]

1. ID3
2. C 4.5
3. CART

Q6. Describe how changes in EEG power could potentially be used to monitor alertness during driving or surveillance. What are some of the obstacles to practical application of the technique to real-world scenarios? [6]

OR

Q6. Describe how evoked potentials can be used for "lie detection" or detection of "guilty knowledge." Compare this approach to the traditional method of polygraphy (Polygraphy measures a subject's bodily reactions such as changes in blood pressure, skin conductivity, and heart rate while he or she answers a series of questions during an interrogation) [6]